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The development of strategic manufacturing capabilities in emerging and developed markets

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Abstract The purpose of this exploratory paper is to find differences in the occurrence of and the relationships between strategic capabilities for manufacturing firms in developed and emerging markets. To this end, a longitudinal approach is taken, and developments of capability structures in the two types of markets over time are analysed. By concentrating on strategic capabilities, this paper adds to the sparse literature on operations' globalisation taking a resource-based, internal perspective.

Keywords Strategic capabilities · Emerging markets · Longitudinal study · Manufacturing strategy

1 Strategic capabilities in emerging and developed markets

Strategic manufacturing capabilities are the contribution of the operations function to the competitive success factors of a company; strategic capabilities are the strengths of a firm with which it supports corporate strategy and which help it succeed in the market place. The identification and development of strategic capabilities are a major task of manufacturing strategy (Slack and Lewis 2002). Capabilities allow an enterprise to exploit resources in order to generate profit through its products and services (Amit and Schoemaker 1993). With the help of its capabilities, an organisation transforms input factors into products and services (Warren 2007). A differentiation is made between four classic strategic capabilities: The ability to (1) produce at a low cost, (2) yield high quality products, (3) ensure a reliable delivery and (4)

maintain flexibility concerning mix and volume of products (Wheelwright 1984). Therefore, this paper—as most other articles in this area—concentrates on these four capabilities, despite the fact that the existence of other capabilities is conceivable, likely, or will become important in the future.

The purpose of this exploratory paper is to find differences in the occurrence of and the relationships between strategic capabilities for manufacturing firms in developed and in emerging markets. In order to achieve this, a longitudinal approach is taken and developments of capability structures in the two types of markets are analysed over time. Although longitudinal analyses are often called for, with the objective of investigating the dynamics of capability developments (e.g., Swink and Way 1995), only little empirical work has been done in this area.

An exception is Lapré and Scudder (2004), who analyse ten US airline companies over a period of eleven years regarding their performance improvement paths. They found that whether firms follow a sand cone model or experience trade-offs between their capabilities depends on the distance to their asset frontier. In line with Porter's (1996) and Schmenner and Swink's (1998) theoretical considerations, firms further away from the asset frontier can improve on more than one capability at the same time; firms closer to the asset frontier can improve in one capability only.

Also concentrating on the issue of strategic capabilities, this article provides a highly aggregated and abstract picture using a large scale questionnaire approach. Due to the international scope of the questionnaire and the four rounds the study has been conducted since 1993, the dynamics of capability relationships can be studied for firms in two types of markets, while still maintaining a longitudinal perspective. Thus, companies from emerging and developed economies are compared.

For instance, one hypothesis that can be tested with this approach is that the structure of strategic capabilities in

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emerging market firms lags a few years behind the structure of the capabilities in developed market firms. With its concentration on strategic capabilities, this paper adds to the sparse literature on operations' globalisation that takes a resource-based, internal perspective (Carr 1993; Collis 1991). Issues of global supply chain configurations (e.g., Cagliano et al. 2008) or global purchasing and sourcing (e.g., Leonidou 1999) are discussed elsewhere.

The structure of the paper is as follows. The IMSS project and databases are presented in the second section. Results of the longitudinal analyses are presented and discussed in the two following sections; three practical implications of the article are put forward. The fifth section provides a short discussion of limitations, along with the formulation of research questions resulting from this exploratory study.

2 The international manufacturing strategy survey project

In this study empirical data is drawn from the International Manufacturing Strategy Survey (IMSS). IMSS has been run four times to date: in 1993, 1998, 2002, and 2006, allowing for a longitudinal investigation. The questionnaire contains items on strategic objectives and programmes, on the organizational and environmental context of management and on performance figures of manufacturing plants from ISIC codes 28–35 (machinery; tools; electrical, electronic and optical devices; measurement devices; transportation facilities). Some questionnaire items as well as some participating companies have been included all four rounds of IMSS, which allows for a strict longitudinal analysis (Goldstein 1979; for an example see Cagliano et al. 2005). Additionally, samples of the different rounds can be assumed to be representative of the population of firms within the examined industries, thus making longitudinal comparisons of mean values between total samples possible as well. The analyses in the paper follow the latter approach, analysing trends in the data.

Most items in the questionnaire come in the form of perceptual measures (Ketokivi and Schroeder 2004). The sampling method was convenience sampling with some random participants; the questionnaires were filled out in the participants' companies, free from influence by the researchers (self-administered study); questionnaires were sent out by mail or fax, frequently after contact had been established by phone. Sample sizes are: 573 for IMSS-1, 445 for IMSS-2, 465 for IMSS-3, and 656 for IMSS-4.

Table 1 shows how strategic capabilities are composed of various questionnaire items (not all items were used in each round of the survey; original questionnaire items are given in the appendix). Items were taken from question D1 (IMSS-1 and IMSS-2), D2 (IMSS-3) and B9 (IMSS-4).

With the exception of IMSS-2, the items ask for changes over the last three years in detailed capabilities. Thus, IMSS does not describe the current state of capabilities but rather the way in which they had been developing in the three years before the questionnaire was sent out. In IMSS-2, the importance of the detail capability is asked for directly, which is in line with the needs of this analysis. In IMSS-2 to IMSS-4 respondents had to answer on a 5 point Likert scale; in IMSS-1, respondents had to estimate changes as percentages of improvement or decline.

In most cases, several items of the IMSS questionnaire are used to represent the four manufacturing capabilities in question, emphasising the multidimensional nature of manufacturing capabilities (Flynn and Flynn 2004). The items are combined to represent manufacturing capabilities following conceptual considerations based on standard texts from the field (Slack et al. 2007; Heizer and Render 2008; Bozarth and Handfield 2008; Krajewski et al. 2010). Thus, the following capability scores are rather representative indices justified by prior literature than statistical factors. This approach was chosen, since the construction of statistically valid factors of capabilities was not the objective of this study. Rather, this paper explores developments based on intuitive definitions of what strategic capabilities are comprised of. By this procedure, the potential drawbacks of such “common sense” definitions are not neglected—however, a conclusive definition of strategic capabilities is left for further study (for an attempt to this end, see Größler and Grübner 2006).

Based on this structure of strategic capabilities, development paths for plants in emerging and developed markets are compared in the rest of this paper. To this end, the samples were split into two groups of ‘emerging’ and ‘developed’ markets by using MSCI equity market indices (<http://www.msci.com/coverage/index.html>). This resulted in a different number of companies located in emerging markets than that in developed markets (Table 2).

3 Results of longitudinal analyses

In this section, two different analyses are presented that are based on the differentiation of companies belonging to either emerging or developed markets: (i) changes in the relative importance given to the four capabilities of the two market types, and (ii) differences in capability relevance between the markets.

For both analyses, strategic manufacturing capabilities are operationalised using the IMSS items as indicated in Table 1. For each strategic capability, the average of the corresponding item values across all companies was calculated. It must be noted that the item format in IMSS-

Table 1 IMSS items identified as indicating manufacturing capabilities with codes given for the respective questionnaire

Manufacturing capability	Item	IMSS-1 (1993)	IMSS-2 (1998)	IMSS-3 (2002)	IMSS-4 (2006)
Quality	Manufacturing conformance	D1	D14	D21	B9A
	Product quality and reliability	–	–	D22	B9B
	Delivery reliability	D9	D117	D29	B9L
Time	Time to market	D7	D16	D26	B9F
	Delivery speed	D23	D115	D28	B9I
	Manufacturing lead time	D19	D112	D210	B9N
Flexibility	Product customisation ability	–	–	D23	B9C
	Volume flexibility	–	–	D24	B9D
	Mix flexibility	D25	D15	D25	B9E
Cost	Labour productivity	–	–	D213	B9Q
	Inventory turnover	D5	D116	D214	B9R
	Capacity utilisation	–	–	D215	B9S
	Overhead costs	–	D111	D216	B9T
	Unit manufacturing cost	–	–	–	B9M

1 is different than the format in the other three IMSS rounds: in IMSS-1 respondents are asked for changes in percentages; in IMSS-2 to IMSS-4 respondents are asked for changes based on a five point Likert scale, ranging from “substantially decreased” to “substantially increased”.

Therefore, in order to compare results for the different IMSS rounds, the weight of a capability in relation to all other capabilities was calculated. These weights indicate the relevance and the emphasis put on a specific capability by management, as compared to the other three strategic capabilities. In the weighting algorithm, the averages of the four capability values for both types of companies (emerging and developed markets) were compared, leading to eight capability values. The value 1.0 was assigned to the lowest of these capabilities; the other capabilities were scaled proportionally. For example, in IMSS-2 (1998) the average of the flexibility capability in developed markets is 2.34. Since this is the lowest of all average values of capabilities for this survey round, a weight of 1.0 was

assigned. The average for the cost capability in emerging markets, for instance, is 3.02. The weight corresponding to this average value is $3.02/2.34=1.29$. This weight calculation was applied to all four capabilities of the two market types for the four IMSS rounds.

This procedure and the results can be explained using the uppermost graph in Fig. 1, which depicts the development of the weights for the *quality* capability. *Quality* started out as an important capability (values above 2 for emerging and developing market companies) as compared to other capabilities in 1993. Until the end of the investigated time span (2006), the weight of *quality* had decreased to just above one, indicating that by then *quality* did not get much more emphasis than the least important capability. Again, this result basically holds for both types of markets, with a slightly higher relevance for *quality* in emerging market firms (the weight of quality for emerging markets in 2006 is about 1.2, for developed markets about 1.1).

The fundamental behaviour of the *time* and the *cost* capability are similar to *quality*, as can be seen in the rest of Fig. 1. These three capabilities started with a high weight compared to at least one other capability, which was *flexibility* in 1993 and 1998. From 2002 onwards, all four capability weights are close to 1.0 (i.e. the lowest possible value), with the highest value of 1.2 (meaning that the associated capability is roughly 20% more important for the companies). This indicates that in the later IMSS rounds no big differences can be observed concerning the emphasis placed on the different capabilities.

Concerning the differences in the relevance of strategic capabilities between emerging and developing markets, it can be stated that in the last two IMSS rounds (2002 and 2006) emerging market companies achieved higher values than their developed markets counterparts. With the exception of the

Table 2 Number of companies in emerging and developed group for the four samples

	Companies in emerging markets (in brackets: number of countries)	Companies in developed markets (in brackets: number of countries)
IMSS-1 (1993)	137 (4)	463 (16)
IMSS-2 (1998)	223 (8)	477 (15)
IMSS-3 (2002)	140 (3)	386 (12)
IMSS-4 (2006)	207 (6)	453 (15)

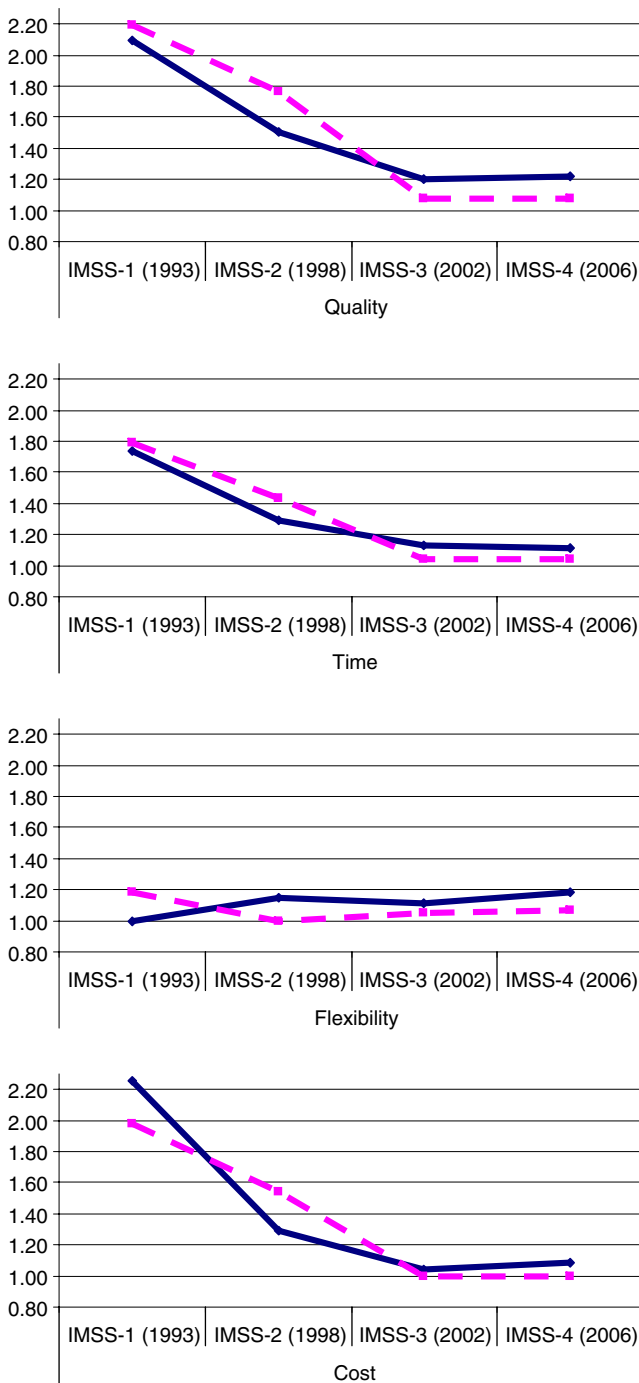


Fig. 1 Development of importance of strategic capabilities for emerging markets (solid line) and developed markets (dashed line)

cost capability, this is different for the first IMSS round (in 1993): developed market companies achieve higher capability values than companies from emerging markets. The *cost* capability seems always to have been the major emphasis of emerging market companies as compared to developed market companies (with the exception of 1998).

Differences between companies in emerging and developed markets become clearer, when considering Fig. 2. The

figure shows the capability weights for the four capabilities, separated for each of the four IMSS rounds, starting with IMSS-1. Again, it can be observed that *flexibility* is the least relevant strategic capability at the beginning of the period, with the other capabilities showing a decrease in their relative weight towards the end of the period (or, more precisely, all four capabilities become equally important).

Significant differences between the capability relevance in the two market types are indicated by an asterisk. These

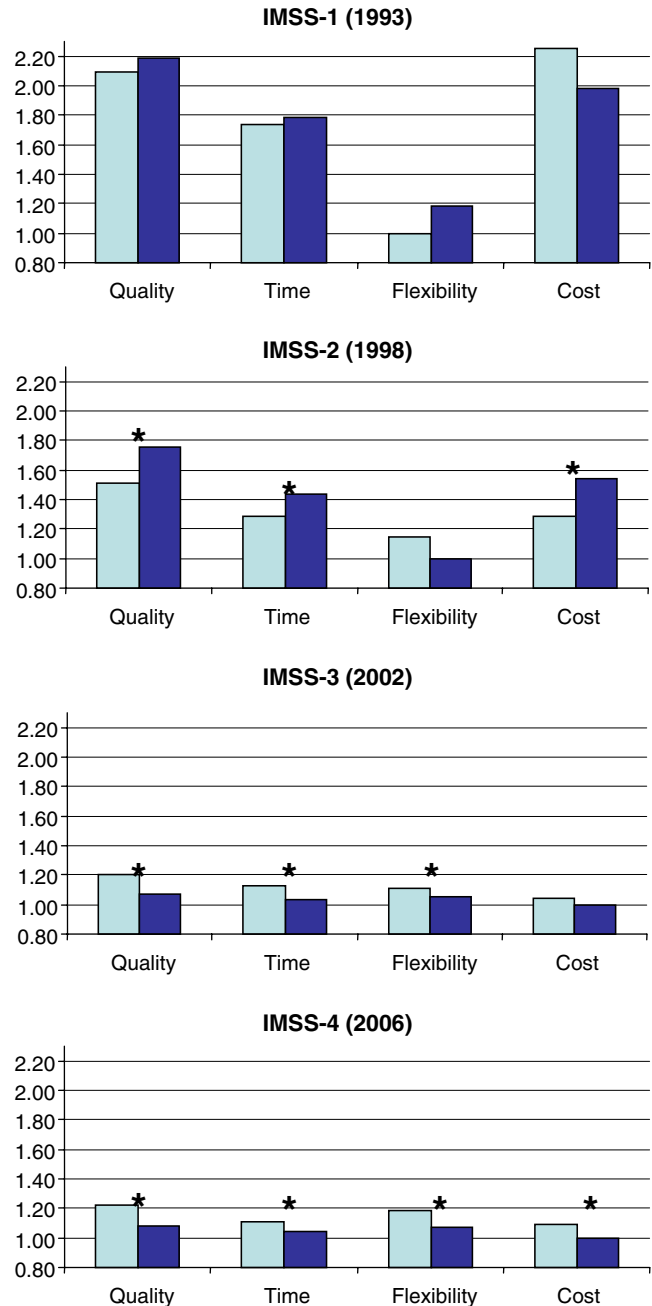


Fig. 2 Weight of strategic capabilities over time for emerging markets (left pillars) and developed markets (right pillars); * indicates significant differences (with at least $p < 0.05$) between emerging and developed market companies

differences were calculated based on a *t*-test, using the capability values of the two groups of companies as input data. Table 3 shows the results of these statistical tests in more detail. The table shows the averages for the four capabilities and the significance level of the differences.

Differences between the two market types seem to have grown over the years. While for 1993 no differences can be confirmed statistically, there are three significant differences in capabilities in the following two IMSS rounds. In the last round (IMSS-4 in 2006), even all four capabilities are significantly different in emerging and developed market firms (with emerging market firms attributing higher relevance to all capabilities than developed market firms in later rounds of the survey).

4 Interpretation of results and practical implications

When interpreting these results, one has to keep in mind two characteristics of the analyses in this paper. First, a lower capability weight does not necessarily mean that the absolute relevance of this capability is decreasing; only the relevance in relation to other capabilities has decreased. Second, changes in capability achievement are interpreted as the relevance perceived and the emphasis put on the capabilities by management (with the exception of IMSS-2, where this is directly asked for). Thus, the assumption is made that increases in capability achievement did not occur randomly but were an effect of deliberate management decisions.

Without first concentrating on the differences between emerging and developing markets, one can describe the shift in terms of the relative relevance between the four strategic manufacturing capabilities from 1993 to 2006. At the

beginning of this period, the *cost* and *quality* capabilities were the most important. *Flexibility* did not play a substantial role, and *time* held a median position between the two highly regarded capabilities and the neglected capability, *flexibility*. This has changed towards the end of the observation interval: all capabilities are becoming equally important, which basically means that *flexibility* is now accepted as a fourth standard capability of manufacturing firms (for a discussion of capability structures see, for example, Ferdows and de Meyer 1990; Flynn and Flynn 2004; Rosenzweig and Roth 2004; Größler and Grübner 2006).

The analyses show that emerging market firms have closed the gap between them and the developed market companies in the relevance they attribute to the four capabilities. While at the beginning of the 1993–2006 period, emerging market firms lagged behind in all but one capability (*cost*), by the end of the period these companies attributed even higher relevance to all capabilities than developed market firms. The one exception to this general observation is the *cost* capability: in 1993 in particular, *cost* seems to be the strategic capability with which emerging market manufacturers wanted to compete (although the difference is not statistically significant). However, this has changed over the years into a balanced focus on of all four capabilities by emerging market companies and developed market companies alike.

The exemplary hypothesis described above (that the structure of strategic capabilities in emerging market firms lags a few years behind the structure of the capabilities in developed market firms) could not be supported by this analysis. For instance, the increasing relevance of *flexibility* as a fourth strategic capability appears to occur in both market types around the same time: *flexibility* seems to be less relevant in 1993 and 1998, while in 2002 and 2006 it

Table 3 Differences in strategic capabilities between companies in emerging and developed markets. Note differences in scales between IMSS-1 and the other three rounds

		Emerging market companies	Developed market companies
IMSS-1 (1993)	Quality	23.73	24.82
	Time	19.70	20.26
	Flexibility	11.33	13.45
	Cost	25.53	22.39
IMSS-2 (1998)	Quality ^a	3.53	4.12
	Time ^a	3.02	3.56
	Flexibility	2.53	2.34
	Cost ^a	3.02	3.61
IMSS-3 (2002)	Quality ^a	3.79	3.39
	Time ^a	3.56	3.27
	Flexibility ^b	3.49	3.32
	Cost	3.29	3.15
IMSS-4 (2006)	Quality ^a	3.14	2.77
	Time ^a	2.86	2.68
	Flexibility ^a	3.04	2.75
	Cost ^a	2.80	2.57

^a indicates a significant difference at $p < 0.01$

^b indicates a significant difference at $p < 0.05$

has basically the same relevance as the other three capabilities in both types of markets, emerging and developed. There is no delay to be observed concerning changes in the capability structure in emerging markets. This study shows that manufacturing firms in emerging markets have caught up with their counterparts from developed markets with regard to strategic capabilities—both groups of companies try to increase all four manufacturing capabilities in a similar fashion, with the emerging market group showing higher increase rates.

The practical implications are threefold. First, manufacturing firms—regardless of whether these are located in emerging or developed market countries—can no longer concentrate on a single strategic capability (as, for instance, emerging market companies have done with *cost* in the past). Being competitive requires pursuing all four capabilities with some (but not necessarily equal) emphasis. The apparently minor differences between the relevance companies attribute to the four capabilities reflect their limited resources; in a world without resource restrictions companies could strongly improve all capabilities simultaneously and to the same degree. With resource limitations, emphasising one capability over another allows for strategic differentiation and firms have to choose on which capabilities they will focus. For instance, in IMSS-4 (2006) firms in both types of markets have emphasised the *quality* and *flexibility* capabilities in contrast to *cost* and *time*.

Second, the differences regarding the relative importance of capabilities have decreased over time: the four classic capabilities: *quality*, *cost*, *time*, and *flexibility*, have grown increasingly similar with respect to the relevance that companies attribute to them. As one can see from the analysis in this study, the capabilities show an increasing approximation to a value of 1.0, a trend which indicates indifference between capabilities relevance. Thus, being able to compete successfully in future might require identifying, developing and exploiting one or more new strategic capabilities (like *innovativeness*), in order to differentiate from the bulk of competitors.

Third, capability differences between companies in emerging markets and those in developed markets diminish. In particular, firms in developed markets should not assume that firms in emerging markets lag behind in the four capabilities—even if the current state of their capabilities might be below the achievement levels of developed market firms (an assumption which can neither be supported nor rejected based on this study), emerging market firm capabilities show a higher growth. Thus, it is only a matter of time before emerging market companies will have caught up with their developed market counterparts. It may even be assumed that emerging market firms can exploit the fact that they started later than developed market firms, learn from the latter's development, and avoid mistakes.

5 Conclusions

The limitations of this longitudinal study are for a large part a result of the design of the IMSS questionnaires and the data collection method used. Although the questionnaire featured an item on the change (and thus the relevance) of capabilities in all four rounds of the IMSS project, the concrete item formulation and scales have changed slightly over the years. Working with weights that put the capabilities in relation instead of working with actual capability values mitigates the problems resulting from this change in item formulation. Furthermore, although longitudinal from the outset, IMSS only allows for trend analyses whenever a substantial sample size is required, since the sample of companies changes between rounds (with only a limited number of companies being kept). A panel design (with a fixed sample of companies investigated over time) might yield additional insights.

Another limitation results from the use of a questionnaire, i.e. firms can obviously only provide answers to questions that have been asked. This means that new developments might be missed, for instance the appearance of a novel strategic capability that firms are trying to develop (e.g. *innovativeness*). Like *flexibility*, these novel capabilities might be rather underrepresented in the beginning but become more prevalent over time.

A research agenda shedding more light on the issues of this article includes, for instance, further statistical analysis with IMSS data; in particular path modelling might be useful to explore the structure of capabilities in emerging and developed markets. In a similar fashion, the findings of this study could be connected with other data from IMSS or from external data sources to check for moderating effects, like company size. In the near future, IMSS-5 data will be available that can be incorporated into the analysis; the data set will become available in the course of 2010. With the availability of this data set, the possibilities of running panel studies and of using a stable questionnaire format will increase as well, at least for the last three rounds of IMSS. Since the sheer number of items that might represent strategic capabilities has increased over time, the later rounds (including IMSS-5) probably allow for the identification of new strategic capabilities that were not covered in earlier questionnaires. Finally, future studies into the development of strategic capabilities might be enriched by qualitative analyses of firms in emerging and developed countries and by the application of other methods than statistics, for instance simulation modelling. Following this research agenda, further insights into the structure and dynamics of strategic manufacturing capabilities in emerging as well as in developed market companies may be expected.

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mits any noncommercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

Appendix A: Questionnaire items

This appendix contains the original questionnaire items from the four IMSS rounds used in this article.

IMSS-1 (1993)

- D. In the following list, we ask you to mentally construct an index for each manufacturing performance indicator. We ask you to assume that the beginning of 1990 is the base with index 100. How large would you estimate that the percentage change in the index today (1992) would be?

		Change in percentage
D1	Conformance to specification (manufacturing quality)	_____
D5	Inventory turnover	_____
D7	Speed of product development	_____
D9	On-time deliveries	_____
D17	Customer service	_____
D23	Delivery lead time	_____
D25	Product variety	_____

IMSS-2 (1998)

		Importance (1 = very low; 5 = very high)
D14	Conformance to specification (manufacturing quality)	_____
D15	Product variety	_____
D16	Speed of product development	_____
D111	Materials and overhead total costs	_____
D112	Manufacturing lead time	_____
D115	Delivery lead time	_____
D116	Inventory turnover (sales / inventory)	_____
D117	On-time deliveries	_____

IMSS-3 (2002)

- D2. Please indicate the amount of change of the following performance dimensions over *the last three years*

		Strongly deteriorated	No change		Strongly improved	
D21	Manufacturing conformance	1	2	3	4	5
D22	Product quality and reliability	1	2	3	4	5
D23	Product customization ability	1	2	3	4	5
D24	Volume flexibility	1	2	3	4	5
D25	Mix flexibility	1	2	3	4	5
D26	Time to market	1	2	3	4	5
D28	Delivery speed	1	2	3	4	5
D29	Delivery reliability	1	2	3	4	5
D210	Manufacturing lead time	1	2	3	4	5
D213	Labor productivity	1	2	3	4	5
D214	Inventory turnover	1	2	3	4	5
D215	Capacity utilization	1	2	3	4	5
D216	Overhead costs	1	2	3	4	5

IMSS-4 (2006)

- B9. How has your operational performance changed over the last three years?

		Compared to three years ago the indicator has				
		deteriorated more than 10%	stayed about the same	improved 10%–30%	improved 30%–50%	improved more than 50%
B9A	Manufacturing conformance	1	2	3	4	5
B9B	Product quality and reliability	1	2	3	4	5
B9C	Product customization ability	1	2	3	4	5
B9D	Volume flexibility	1	2	3	4	5
B9E	Mix flexibility	1	2	3	4	5
B9F	Time to market	1	2	3	4	5
B9I	Delivery speed	1	2	3	4	5
B9L	Delivery dependability	1	2	3	4	5
B9M	Unit manufacturing cost	1	2	3	4	5
B9N	Manufacturing lead time	1	2	3	4	5
B9Q	Labour productivity	1	2	3	4	5
B9R	Inventory turnover	1	2	3	4	5
B9S	Capacity utilization	1	2	3	4	5
B9T	Overhead costs	1	2	3	4	5

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